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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/743,634
Filing Date: March 16, 2001
Appellant(s): BURVENICH ET AL.

Ray Heflin
Harness, Dickey, & Pierce, P.L.C.
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 8/9/2004.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

The rejection of claims 1, 2, 4-6, 8, 10, 11, 13, 15, 16, 18-23, and 26 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,808,891	Lee et al	9-1998

5,222,192	Shaefer	6-1993
5,404,516	Georgiades	4-1995

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 2, 4-6, 8, 10, 11, 13, 15, 16, 18-23, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,808,891 to Lee et al in view of U.S. Patent No. 5,222,192 to Shaefer and further in view of U.S. Patent No. 5,404,516 to Georgiades et al.

3. Referring to claims 1, 6, 20-22, Lee shows a continuous casting and rolling plant, and a method of operating a continuous casting and rolling plant with a computing unit, including a plurality of slabs belonging to different production orders within sequences on the continuous casting and rolling plant ("Order Load", Abstract), comprising: determining a solution indicating the order of the slabs belonging to the production orders within the sequences with the computing unit, and controlling the continuous casting and rolling plant by the computing unit in accordance with the order determined (Col 6, lines 53-61), wherein controlling the continuous casting plant by the computing unit includes defining an operational sequence for the entire continuous casting and rolling plant (schedules as shown above).

4. Lee does not show that the order determination step is accomplished by using genetic algorithms. Lee also does not show evaluating the solution by and event-oriented evaluation, wherein the event-oriented evaluation is carried out by simulating the operation of the continuous casting and rolling plant.

5. Georgiades shows a system for allocating resources where genetic algorithms are used in a manufacturing environment. The "final evaluation processor" of Georgiades (col 5, line 56 – col 6 line 14) shows evaluating the potential solutions to determine the "fitness" of each solution. Georgiades also provides motivation for using Genetic Algorithms in a scheduling and acquisition system.

6. Shaefer shows the use of Genetic Algorithms as a problem solving technique where random optimization is needed (Abstract, Patent Subject) and goes into deep detail about genetic algorithms and their role in problem solving techniques. Shaefer is used primarily to show the details on genetic algorithms needed to reject all dependant claims.

7. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the Genetic Algorithms of Shaefer and Georgiades in place of the optimization technique of Lee because genetic algorithms provide "extraordinarily quick discovery of early approximate solutions" (Shaefer, Col 3, lines 43-50) and the optimization and final evaluation processor of Georgiades provides for the evaluation step and shows that scheduling using genetic algorithms in scheduling and management environments is well known. This substitution is also made for all inherent traits of genetic algorithms as are shown with relation to Shaefer below.

8. Specifically with regards to claims 21 and 22, the goal of genetic algorithms in this application is to determine a "solution space" or schedule (starting point) for operating the casting plant.

9. Referring to claim 2, Shaefer shows wherein at least one of a selection, a recombination, or a mutation is carried out by the genetic algorithm ("mutation", Col 3, lines 27-34).

10. Examiner notes that these are all inherent functions of a Genetic Algorithm.

11. Referring to claims 4 and 10, Shaefer shows wherein the order of the slabs belonging to the production orders within the sequences is determined with the computing unit by an event-oriented evaluation (Fig. 5 and Col 8, lines 62-65) according to the quality of the solutions.

12. Examiner notes that an evaluation according to quality step is inherent to the use of genetic algorithms.

13. Referring to claims 5, and 11, 13, and 15, Shaefer shows where a starting solution, as a starting point, is determined by the computing unit (Col 2, lines 3-6).

14. Examiner notes that creating a random starting point is inherent to all genetic algorithms and would inherently be selected by the computing unit.

15. Referring to claim 8, Lee shows wherein the continuous casting and rolling plant is a thin-slab continuous casting and rolling plant ("Rolled to desired thickness", Col 2, lines 22-28).

16. Referring to claims 16, 18, and 19, Lee shows a continuous casting and rolling plant wherein the plurality of slabs which belong to different production orders are produced within sequences on the continuous casting and rolling plant ("Order Load", Abstract), wherein the computing unit determines the order of the slabs belonging to the production orders within the sequences (Col 6, lines 53-61).

17. Referring to claim 23, Georgiades shows wherein the data pertains to at least one of delivery dates, quantities to be delivered, and order-related restrictions. Examiner notes that asset scheduling systems as clearly shown in Georgiades would obviously take into account deliver dates of the assets being scheduled.

18. Referring to claim 26, Lee shows wherein technical characteristics of the continuous casting and rolling plant are evaluated during the simulating step, the technical characteristics including at least a number and type of continuous caster. Lee clearly shows creating a schedule for a casting and rolling plant which would contain a number and type of continuous caster.

(11) Response to Argument

In defense of the Final Rejection under 35 U.S.C. 103(a), the Examiner will first describe the well known problem solving technique of Genetic Algorithms and how they relate to the current application.

Genetic algorithms are a part of evolutionary computing, which is a rapidly growing area of artificial intelligence. As you can guess, genetic algorithms are inspired by Darwin's theory of evolution. Simply said, problems are solved by an evolutionary process resulting in a best (fittest) solution - in other words, the solution is evolved. Below is the basic outline of the steps of a genetic algorithm.

Outline of the Basic Genetic Algorithm

1. **[Start]** Generate random population of *n* chromosomes (suitable solutions for the problem)
2. **[Fitness]** Evaluate the fitness *f(x)* of each chromosome *x* in the population
3. **[New population]** Create a new population by repeating following steps until the new population is complete
    1. **[Selection]** Select two parent chromosomes from a population according to their fitness (the better fitness, the bigger chance to be selected)
    2. **[Crossover]** With a crossover probability cross over the parents to form new offspring (children). If no crossover was performed, offspring is the exact copy of parents.
    3. **[Mutation]** With a mutation probability mutate new offspring at each locus (position in chromosome).
    4. **[Accepting]** Place new offspring in the new population
4. **[Replace]** Use new generated population for a further run of the algorithm
5. **[Test]** If the end condition is satisfied, **stop**, and return the best solution in current population
6. **[Loop]** Go to step **2**

In this case, appellant is simply taking the steps of a genetic algorithm and transferring them into the manufacturing environment of a continuous casting and rolling plant. Appellant

begins the argument section of the appeal brief by stating that independent claims 1 and 20 recite the following two features:

1) determining a solution for controlling a continuous casting and rolling plant using a "genetic algorithm;" and

2) evaluating the solution by "simulating the operation of the continuous casting and rolling plant".

Examiner submits that the first feature, determining a solution, is done using step number one of the outline of the basic genetic algorithm as shown above. Examiner further submits that the second feature, the evaluation step, is done in step two of the outline of the basic genetic algorithm as shown above. These steps have not been shown to have been done in a continuous casting and rolling plant, which is the purpose of the 103 rejection.

Examiner will now explain the references and their relation to the appellant's remarks throughout the prosecution of the present application.

Lee describes the automated creation of a schedule in a continuous rolling and casting plant. Examiner agrees with the appellant's assessment that Lee does not show using genetic algorithms or an evaluation/simulation step. Lee does show creating solutions using the Monte Carlo method and dropping solution sets based on their suitability for the task.

The Shaefer patent goes into deep detail about Genetic Algorithms and the approaches used to take full advantage of the outcomes of Genetic Algorithm calculations. Shaefer shows these calculations in a general way, not necessarily relating to manufacturing, but as a necessary teaching aid to show all ways that Genetic Algorithms arrive at the best solution to any problem.

Finally, the Georgiades shows the use of Genetic Algorithms to provide a optimized schedule in a manufacturing environment. It must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

19. Appellant argues that the motivation to combine the references is in error. Examiner submits that the Lee patent shows an automated scheduling system for a continuous casting and rolling plant while the Georgiades patent shows the use of genetic algorithms for scheduling. The "final evaluation processor" of Georgiades (col 5, line 56 – col 6 line 14) shows evaluating the potential solutions to determine the "fitness" of each solution. Georgiades also provides motivation for using Genetic Algorithms in a scheduling and acquisition system. The Shaefer patent is merely relied upon to add detail to the definition of "genetic algorithm" and to provide support in rejecting the dependant claims. Examiner submits that it would have been obvious to one of ordinary skill at the time the invention was made to use the Genetic Algorithms of Georgiades, as shown in detail in Shaefer, in place of the optimization technique of Lee because genetic algorithms provide "extraordinarily quick discovery of early approximate solutions" (Shaefer, Col 3, lines 43-50) and the optimization and final evaluation processor of Georgiades provides for the evaluation step. Appellant's argument that the current invention is "not concerned with the quick discovery of solutions" is irrelevant to the validity of the combination of these references.

Appellant's second argument deals with whether the prior art as previously identified shows the claimed "Evaluating" feature. Appellant claims that the evaluating feature "is carried out by simulating the operation of the continuous casting and rolling plant". While this statement is obviously not found in any of the references genetic algorithms, as discussed above, inherently provide an evaluating feature which will evaluate a solution. The terms "simulation" and "evaluation" are considered to be one and the same by the examiner in relation to genetic algorithms. Viewing the flow diagram of a genetic algorithm shown above, step 6 (loop) provides for finding the best solution after the evaluating step 2. The only judgement to be made in a manufacturing environment, when looking for a way to evaluate these potential solutions, would be to approximate the outcome if that solution was actually used (simulate the result). Page 13 of appellants specification goes into detail of additional features taken into consideration regarding a simulation/evaluation in a continuous casting and rolling plant, but these are not claimed elements and have not be read into the claims as such. Since the only way to evaluate a continuous casting and rolling plant would be based upon the results of the continuous casting and rolling schedule created as claimed, examiner submits that it would have been obvious to one of ordinary skill at the time the invention was made to use this "simulation" technique to evaluate the genetic algorithm as shown in step two of the genetic algorithm outline above. The Shaefer patent clearly shows "analysis of the quality of the estimated solutions" which, in the examiners opinion, is a simulation of the outcome.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Michael Daniel Masinick
September 3, 2004

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